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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,982	06/10/2004	Hsin-Chang Wu	NAUP0590USA	3981

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EXAMINER	
NGUYEN, THANH T	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 03/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/709,982	WU, HSIN-CHANG	
	Examiner	Art Unit	
	Thanh T. Nguyen	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

Oath/Declaration filed on 6/10/04 has been considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over The Admitted Prior Art (paragraphs# 4-10) in view of Bradshaw et al. (U.S. Patent No. 2004/0097075) or Dalton et al. (U.S. Patent No. Publication No. 2002/0145200).

Referring to figures 1-3, The Admitted Prior Art teaches a method of fabricating an interconnect structure having reduced internal stress, comprising the steps of:

providing a semiconductor substrate having a base dielectric layer thereon (10);

forming a damascened interconnect structure in the base dielectric layer (112/114, see fig. 1);

capping the damascened interconnect structure and the base dielectric layer with a first dielectric barrier (12);

executing a first chemical vapor deposition (CVD) process within a CVD reactor to deposit a first low-k dielectric film having a pre-selected thickness onto the first dielectric barrier (14, see fig. 2, paragraph# 6);

executing a first cooling process within the CVD reactor for cooling down the first low-k dielectric film (see paragraph# 6, figure 2); and

capping the low-k film stack with a second dielectric barrier (16).

Regarding to claim 4-5, 10, the dielectric barrier film is silicon nitride (see figure 3, paragraphs# 5-6).

Regarding to claims 7, 8, 10, the damascened interconnect structure comprises a barrier layer (124), and a copper core (122) that are embedded in the base dielectric layer (14, see figure 3).

However, the reference does not teach forming multiple CVD low k dielectric film with dielectric constant less than 3.0, the first and second dielectric films have the same compositions, and the thickness of the dielectric film.

It would be obvious to one ordinary skill in the art to form a plurality of oxide layers each having different thickness with the same process as using in the first oxide layer to form a thicker oxide layer since it is well-known in the art to repeat the same process for multiple effect. See St. Regis paper, Co. V. Bemis Co. Inc. 193 USPQ 8, 11 (7th circuit 1977).

Bradshaw et al. teaches forming multiple dielectric layer by using low-k dielectric constant (9, see paragraph# 26), dielectric constant that is less than 3.0 (see paragraph# 26, meeting claims 6, 11).

Dalton et al. teaches forming multiple dielectric layer (12) by using low-k dielectric constant that is less than 3.0 (see figure 1, paragraph# 30, 32-33, meeting claims 6, 11).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a multiple low k dielectric layers instead of single low k dielectric layer in process of the Admitted Prior Art as taught by Bradshaw et al. or Dalton et al. because forming a multiple dielectric film would provide a flatten surface so that that the subsequent layer will easily form as well as reduce the formation of void.

In re claims 3, 9, the selection of the thickness is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species in re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). In such a situation, applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to prior art range. See M.P.E.P 2144.05 III.

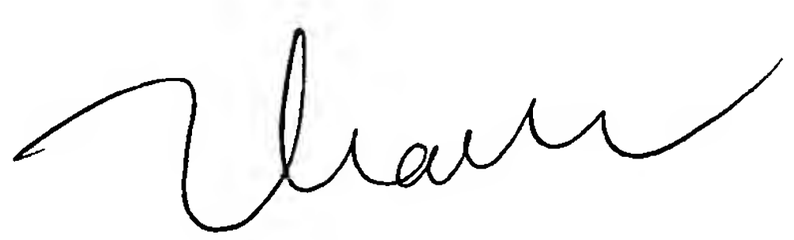
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to thy Private PAIR system, contact the Electronic Business center (EBC) at 866-217-9197 (toll-free).



Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN